and hence may be exceedingly rapid, so that sometimes an irregular movement or shaking results and produces the impression of too large a pulse volume. This is readily detected by noting that the meniscus of the index does not pause for an instant at the point at which the index is read but exhibits vibrating individual movements. To prevent this the index is shortened to 1 cm. or less by allowing part of it to flow into one of the ampullæ.

Estimation of the Pulse Work (Arbeit). The *work* (*A*) is reckoned according to the following formula:

$A = V \times P \times 13.6$ gram centimeters in which:

A = work,

V = volume of the dammed pulse expressed in cubic centimeters.

P = optimal pressure expressed in cubic centimeters Hg.

13.6 = specific gravity of mercury.

The accompanying table will facilitate this computation:

P. (cm. Hg.)	P. × 13.6.	P. (cm. Hg.)	P. × 13.6.	P. (cm. Hg.)	P. × 13.6.
1	13.6	11	149.6	21	285.6
2	27.2	12	163.2	22	299.2
3	40.8	13	176.8	23	312.8
4	54.4	14	190.4	24	326.4
5	68.0	15	204.0	25	340.0
6	81.6	16	217.6	26	353.6
7	95.2	17	231.2	27	367.2
8	108.8	18	244.8	28	380.8
9	122.4	19	258.4	29	394.4
10	136.0	20	272.0	30	408.0

The Superiority of Volumebolometry to Pressurebolometry. As contrasted with the pressurebolometric equations the barometric pressure is entirely disregarded in volumebolometry, an advantage when employing this clinical method at elevations above 3000 feet. Another advantage is that the values are much less dependent upon an optimal application of the cuff, since in virtue of the large air space the increase of pressure in the system to produce the pulsations is a minimal one. It is advisable, however, even with this method, to secure an optimal cuff application, but this is accomplished by comparatively moderate tension of the cuff.

THE DIAGNOSIS OF CHRONIC APPENDICITIS.[1]

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The recognition of chronic appendicitis presents many difficulties: on the one hand because its own manifestations are so variable,

[1] Read before the Nevada State Medical Society, at Reno, Nevada.

and on the other hand because so many conditions simulate it. Every patient seeking advice for stomach trouble or indigestion or abdominal pain may have chronic appendicitis as a cause while many that complain of ailments more remote, such as recurring headaches, failure to gain in weight, persistent vague symptoms, such as lack of energy and incapacity for exertion, may really owe their ill health to chronic appendicitis, as shown by their return to normal after a diseased appendix has been removed. But disease of the gall-bladder, of the ovary or the Fallopian tube or of the kidney may each produce symptoms so much like those of chronic appendicitis that to escape error in diagnosis requires the utmost care. From all sides, therefore, we are beset by difficulties, and the greater the experience the greater the caution about reaching a conclusion. Although this subject has been discussed so extensively during the past decade that not much new remains to be said, nevertheless a consideration of problems as actually presented in every-day work may be of value, because they will serve to show by what methods we decide that a diseased appendix produces the symptoms for which the patient seeks advice.

How frequently is chronic appendicitis a factor in ill-health? Probably not so often as many are ready to believe. Among 2116 medical cases seen in private practice during the five years from January 1, 1912, to January 1, 1917, only 71 after careful study presented evidence sufficiently definite so that a diagnosis of chronic appendicitis could conscientiously be made. During this same period 297 cases of chronic gastric disease were seen and 62 of chronic gall-bladder disease. The conclusion has thus gradually been reached that chronic appendicitis is too often suspected as an adequate explanation for obscure digestive ailments—much more often than is justified by the fact. There is too great a tendency to convict the appendix without sufficient evidence and to advise its removal on the basis that it is a useless organ anyway, and taking it out can do no harm. Unfortunately it is also true that in many cases taking it out can do no good.

I. HISTORY. As a means of diagnosis a careful history is always of the highest value, and it is worth while to note of what these chronic appendicitis cases complain. Of the 71 observed, 31 sought advice for "stomach trouble," 25 for pain in the abdomen, 4 for persistent abdominal soreness and tenderness, 1 for "gas in the bowels," but 7 complained chiefly of recurring headaches and 3 of lack of energy and vitality.

Stomach Trouble. Unfortunately the stomach symptoms are not always the same, so that no conclusion can be reached from this part of the story alone. Some of the cases resemble gastric ulcer in their chronicity and periodicity; with gastric attacks lasting for weeks or months, followed by days, weeks or months of remission or complete intermission of symptoms; and in the character of their

symptoms, with burning pain in the epigastrium or right or left hypochondrium as the chief complaint, this pain coming on one to four hours after eating, accompanied by belching, waterbrash and nausea. This group is found, as will be shown later, to have a reflex hyperchlorhydria as the cause of their gastric suffering. A smaller group of cases resembles chronic gastritis, with distress soon after taking food, a sense of fulness and distention but not of pain, much belching of gas and frequently regurgitation of a mouthful of food, this process going on over and over after each meal. This group shows on analysis a subacidity, but in some there must be the added factor of pylorospasm, reflex from the diseased appendix.

The history of these cases taken by itself may create suspicion of the appendix, but that is all; other symptoms and other evidence must be sought for in various ways to be described before reasonable certainty can be reached. The difficulty is that the patient's complaint about the stomach is frequently so loud and persistent that it leads the physician himself astray, directing all his attention to this organ instead of to the one really diseased.

Pain in the Abdomen. Twenty-five patients who came for advice about this symptom were found to belong in the group of chronic appendicitis. In some the pain was definitely referred to the right lower quadrant, present constantly or in spells; in others it was not so well defined but referred simply to the abdomen or to the bowels. Sometimes complaint was made also of tenderness and soreness, increased by jarring or jolting, as by riding on horseback or in an automobile. This pain was variously described as an ache, a hurting, a sense of distention or simply as soreness. It might be very annoying for days and then for days might practically disappear. In every instance this had gone on so for months or for years. Such a story, while in no way diagnostic, is extremely suggestive, and no one hearing it would probably fail to think of chronic appendicitis as a likely cause. The same is true of the four other histories in which abdominal soreness and tenderness were the chief complaints. Different patients express their discomfort in different ways, but with all these variations of the story of persistent abdominal pain and soreness the appendix as a cause should be given almost the first thought.

Symptoms Outside the Abdomen. When the patient's story is of trouble in the abdomen it is not likely the appendix would be forgotten in the search for an explanation. But 7 in the group here reviewed sought advice especially for recurring headaches and 3 for lack of energy and vitality. With such complaints, chronic appendicitis would scarcely be suspected; and yet these and other symptoms in remote parts of the body may result as the chief manifestation. The explanation perhaps lies in the associated constipation due to adhesions, with resultant auto-intoxication; but

whatever the relation may be the fact remains that in certain of these cases to be reported, removal of a diseased appendix has relieved these remote symptoms after other methods of treatment had failed.

Constipation. As regards this symptom it is too common an ailment to have any significance in relation to chronic appendicitis. The two conditions are often associated, but the question then is which preceded, which is cause and which effect. It is also being discovered gradually, as roentgen-ray plates are being made more frequently, that both the constipation and the chronic appendicitis may be secondary to prolapse of the cecum and colon and consequent stasis of contents. Chronic constipation may be due to mechanical difficulties produced by adhesions about a chronically inflamed appendix, but may be due, and probably more often is, to other factors entirely, which have likewise caused the appendix to become diseased.

Previous Acute Attacks. In any history of chronic digestive ailment a question of great importance is whether there have ever been attacks of pain in the abdomen that might have been due to acute inflammation of the appendix. These attacks may have occurred long before the patient comes for advice and may be forgotten unless sought for or they may occur from time to time simply as subacute exacerbations of the chronic disturbance or there may have been one or two previous attacks not recognized as appendicitis but called "ptomain poisoning," inflammation of the bowels, or simply "colic," and never given a thought in connection with the subsequent chronic disturbance of digestion. Such a history of previous acute attacks could be elicited in 37 of the 71 cases in this group, but not in the other 34. The significant fact lies in the absence of any such history, for it suggests that chronic appendicitis may be chronic from the beginning and that an acute onset of any sort is not essential to establish the diagnosis.

In general there is no type of history from which alone a diagnosis can be reached. Sometimes one complaint and sometimes another predominates, and sometimes there is a mixture of all those described. But other and more definite evidence must be obtained before suspicion becomes conviction.

II. PHYSICAL SIGNS. The evidence found on abdominal palpation to prove that chronic appendicitis exists may be very definite or very indefinite, very extensive or very slight. A palpable mass in the appendix area, varying in size or shape, like a thumb or a hen's egg or a sausage, with more or less tenderness on pressure—these are the expected findings. But experience teaches that these signs are very variable. No mass at all may be palpable, but the patient complains of intense pain when pressure is made over the usual appendix site; rigidity and muscle spasm may be present in the right lower quadrant of so great degree as to make localization

of any mass beneath impossible; or no mass or tenderness whatever may be found at one time of examination, though both may be present at another time. As is also well known the greatest tenderness may be found high up along the ascending colon, prompting one to suspect the gall-bladder; or low down in the inguinal region, leading in female patients to the conclusion that the disease is pelvic. Among the 71 patients whose histories have been reviewed, 62 presented definite physical signs in the appendix area, but 9 presented no evidence that could be interpreted to mean chronic inflammation there. Of these 9 patients, 6 proved at operation and 1 at autopsy to have chronic appendicitis. The other 2 have never yet had operation so far as can be traced. The diagnosis was made in these cases, and operation was advised on other data to be described as we proceed; but the point to be emphasized at this time is that absence of the signs usually expected on palpation of the right lower quadrant does not prove the absence of chronic appendix inflammation.

There are several explanations to account for this failure to find what ought to be found: (1) When the appendix lies behind the cecum, firmly attached to it by adhesions, one has to palpate not only through the abdominal wall but through the cecum in order to feel what lies beneath, and this is usually impossible; (2) one of the most troublesome forms of chronic appendicitis, so far as reflex symptoms are concerned, is the atrophic or obliterative type, where repeated disease has caused the appendix to shrivel and become buried in adhesions so that no mass exists to palpate; (3) the appendix inflammation when examination is made may be so quiescent that it gives no local evidence, even though reflex symptoms in the stomach or elsewhere persist and are very annoying; but sooner or later an exacerbation occurs and then the local signs become perfectly definite.

The lesson taught by these records is clearly that no one factor in the diagnosis is conclusive. Physical examination gives accurate information more frequently than does history alone, and the two together make us more certain than either one can by itself. But it is necessary to get together all the evidence by every possible method of investigation before we can reach anything like absolute certainty.

III. Gastric Analysis. In the cases with gastric symptoms predominant one must investigate the stomach secretions, as a routine part of the examination, in order to reach a diagnosis. This was done in 39 of these patients, and in 28 hyperchlorhydria was found. In 1 the total acidity was 96, in 4 between 80 and 90, in 5 between 70 and 80, in 13 between 60 and 70, in 5 between 50 and 60. In 8 the secretion was practically normal, with total acidity 40 to 50, and in 3 it was subnormal, or below 40, with 1 case under 10. It is evident there is no diagnostic analysis to indicate chronic appen-

dicitis, though the most common finding is a hyperchlorhydria. But if this finding happens to coincide with negative and dubious physical signs about the appendix, it is more likely to be attributed to some other cause, as ulcer, and so may be a hindrance rather than an aid to diagnosis.

IV. Radiographic Examination. The value of this method in recognizing chronic appendicitis has not been generally accepted and is still in question, and the experts themselves differ as to just what findings shall be interpreted to mean a diseased appendix. Nevertheless, it seems certain that as every case suspected should be given the benefit of every possible method of investigation, roentgen-ray examination can no longer be omitted. During the past year this conviction has been adopted and acted upon, and with increasing experience in the study of plates of the cecum and appendix no one can doubt the value of them or would be satisfied to give an opinion without their assistance in reaching it.

To begin with, the radiographic examination is at least eliminative of gastric conditions that confuse the diagnosis. History and gastric analysis may point direct to ulcer of the pylorus or duodenum; but if the antrum, pylorus and cap are normal on the plates the diagnosis of ulcer is evidently dubious. No patient should ever be advised to undergo operation for ulcer unless roentgen-ray plates have first been made. The only exceptions to this rule are the emergency cases, in which recent hemorrhage or continued vomiting preclude the administration of barium mixtures or when it is imperative there should be no delay. Some of the chronic appendix cases in this group of 71 were victims of a mistaken diagnosis, because in the earlier years recorded no roentgen-ray plates had been made, and only at operation advised for ulcer was it discovered that no ulcer existed but a chronic inflammation of the appendix.

But direct evidence as well as indirect can be obtained from the plates. What one may expect to find is epitomized thus by Case:[2] (1) poor drainage; (2) localized tenderness on acute palpation done under fluorescent guidance; (3) kinking; (4) irregularities in the lumen; (5) unduly long or large appendix. Most observers agree that long delay in emptying, with retention of opaque material in the appendix after it has disappeared from the cecum, means poor drainage due to inflamed walls, and can be depended upon as a sign of great significance.

It is admitted that a diseased appendix may fail to show on the plate because it is posteecal and obscured by the opaque material in the cecum; or because it is obliterated and cannot fill; so that negative evidence does not become a bar to the diagnosis in the face of a definite history and physical signs. But localized tenderness under the fluoroscopic screen, kinking, irregularities in lumen,

[2] Interstate Med. Jour., April, 1917, p. 339.

such as clubbing, long delay in emptying, with evidence of adhesions to the bowel, all constitute positive proof of abnormality that add much to the clinical picture. The only danger is that this method of examination will be accepted by the lazy man as a short cut to diagnosis, to the exclusion of other and older methods, such as a detailed history, careful palpation of the abdomen and gastric analyses. The value of radiographic examination is great in the diagnosis of chronic appendicitis, and no investigation at the present day is complete without it; but it is only a part and can never become the whole.

V. OPERATION. This method is not advised for diagnosis, but after diagnosis has been made it has been found a valuable method for revision. Out of the 71 cases in this group, operation was done on only 32 under direct observation here or as reported by the operator to whom they were referred. Others undoubtedly came to operation, but no record is at hand of what was found. The most valuable lessons have been learned from these operated cases, not so much by confirmation of conditions as predicted, but more by the additional information thus acquired, at times different entirely from what had been expected. A review of some of these cases will best serve to call attention to routine methods of diagnosis, to some of the common errors and to the problems presented in differential diagnosis.

1. *Obvious Cases.* A certain number of these patients present an easily recognized typical picture that can scarcely be mistaken, and of such the following is an instance.

CASE HISTORY. A man, aged thirty years, first seen in October, 1912, sought advice for "stomach trouble." He had been annoyed at intervals for two years, his attacks coming once a month or once in two months and lasting about a week. At these times he complained of burning pain in his right side, at the edge of the ribs, appearing two to four hours after meals, with belching, nausea and heartburn. In addition to this story about his stomach he had another, of an attack in August, 1910, characterized by cramps in the abdomen and diarrhea, lasting for two days, and two months later of a similar attack, with much abdominal pain. Four months after that he began to have more constant pain in the right side of his abdomen, with tenderness to touch; and ever since he had had this pain more or less persistently. Any jarring or jolting, as in riding horseback, would start the pain. Once he had such a severe attack of this pain that he had to quit work and go to bed. This patient's stomach showed a hyperchlorhydria, with total acidity 60, free HCl 28, combined HCl 24; and he had in his appendix area a mass the size of a hen's egg, very tender on manipulation. Operation at the time was declined and for a year he tried to get along with diet, laxatives, olive oil and alkalies. But he did not improve, and finally was operated on in December, 1913, when an extensively

inflamed appendix was removed. After that his symptoms all disappeared.

If all cases presented symptoms and signs like the foregoing one would seldom have any difficulty in recognizing their meaning, but many variations from this type occur. Perhaps the greatest difficulty of all arises when stomach complaints predominate and any history or physical signs pointing to appendix disease are for a long time lacking. The following case histories bring this out.

2. *Unexplained Gastric Cases.* A man, aged twenty-eight years, seen in January, 1915, complained only of stomach trouble, which had existed for four years intermittently. There were intervals when his stomach seemed perfectly normal. His spells varied in duration, averaging several weeks, but had gradually become more frequent. At these times he had good appetite, but soon after eating gas formed, his stomach seemed to swell, he belched much gas and had a dull pain over his stomach. Eating the next meal relieved for about an hour, then the trouble began again. His bowels were obstinately constipated, but no history could be elicited of any attacks that could be interpreted as acute appendicitis nor of any pain in the appendix area. The stomach showed hyperchlorhydria, in explanation of his symptoms, but there were absolutely no signs in the right lower quadrant that could be taken to mean a diseased appendix. A few months later, however, in April, 1915, he had a sudden attack of acute purulent appendicitis, necessitating immediate operation, when it was found than an old chronic inflammation had long preceded the acute attack.

A large fat man seen in February, 1914, said his stomach had troubled him constantly for the past five or six years. He had no appetite at all; as soon as he ate he felt like vomiting; at least once every day he did vomit what he had eaten at the previous meal; he often felt nauseated on first rising, before taking any food; and when he did not get rid of a meal, felt he would be better if it was out, because it caused so much heaviness and distress, with belching of gas. This patient was obstinately constipated and never had a movement without physic. Recently he had noted some feeling of fulness in the right side of his abdomen if his bowels did not move, but never had any severe pain there. Palpation showed tenderness on deep pressure over the appendix, but no mass of any kind could be felt. The stomach contents contained an abundance of thick ropy mucus and showed a hyperchlorhydria, with total acidity 70, free HCl 50 and combined HCl 10. The only definite findings were gastric, with nothing to justify a diagnosis of chronic appendicitis, even though it was suspected. This patient's symptoms persisted in spite of treatment, until finally he had an acute attack of appendicitis in July, 1914, necessitating immediate operation, which showed an appendix kinked and bound down by many old adhesions. After its removal the gastric symptoms all disappeared.

A girl, aged sixteen years, seen in October, 1915, sought advice for stomach trouble of long duration, with severe headaches, dizziness and lack of energy. A year before she had her tonsils removed and a bony growth from her nose, because she was told the operation would restore her health, but it did no good. She continued to complain that everything she ate disagreed and gave her pain in her left side under the ribs. These pains came on about a half-hour after eating, especially after eating sour food, such as tomatoes or fruits. She had headaches almost all the time, with dizziness, and her bowels were always constipated. Her stomach showed a hyperchlorhydria, with total acidity 64, free HCl 20 and combined HCl 32. At this time she had no complaint to make of her abdomen, and examination gave no evidence of appendix inflammation. But she continued to be troubled by sour stomach in spite of diet and laxatives, and the following December complained for the first time of pains lower down in the bowels on the right side. Finally, early in January, she had an acute attack of appendicitis, necessitating immediate operation, and this showed old chronic adhesions, indicating that the recent attack was not the first.

In all three of these cases whose histories have been related, roentgen-ray plates of stomach and intestines would have thrown light on the real pathology present, and would have aided in reaching a correct diagnosis before the final acute attack. In all such unexplained gastric cases there is a cause, and even though no appendix evidence is found at one examination it may appear at another, while roentgen-ray plates may show trouble with the appendix even when physical examination is dubious.

3. *Cases Simulating Ulcer.*. In still another group of cases the clinical history and the stomach analysis appear to speak so positively for gastric or duodenal ulcer, while the physical examination of the appendix region is persistently negative, that the case seems too clear for doubt. Here again error can now be avoided by roentgen-ray plates, but this was not appreciated in the earlier years that this report covers. Instances of such wrongly diagnosed cases are the following:

A physician, aged thirty-six years, who consulted me in February, 1914, had suffered ever since he was eighteen years from severe attacks called "gastralgia," characterized by heartburn, waterbrash, sour stomach and gas. He was always thin, slender and neurasthenic. His stomach would have periods of improvement, then again would relapse, and during all these years he had never been entirely free of his indigestion. At the time he sought advice he had suffered, especially for six weeks, with pain coming on several hours after food, particularly at night, so severe he could not sleep; also heartburn, sour regurgitations, belching of gas and nausea. Physical examination showed rigidity and tenseness of the abdominal wall over the upper half, more in the right hypochondrium than

elsewhere; great tenderness there on pressure, which increased his pain; but no tenderness or rigidity elsewhere. Stomach analyses made repeatedly throughout twelve years previous to his consulting me, as well as at this time, showed always a high-grade hyperchlorhydria. Operation advised for duodenal ulcer proved conclusively there was no ulcer in either the duodenum or the stomach, but a chronic appendicitis was found, of obliterative type, with the remains of the appendix very small, hard and fibrous and buried in a mass of adhesions. After its removal he had no further dyspepsia. Within a year he gained forty pounds in weight and correspondingly in energy and efficiency.

A man, aged forty years, also seen in February, 1914, complained of stomach trouble for years past: soreness over the stomach, recurring "bilious spells," with ravenous hunger, pain over one eye, sick stomach and vomiting, and at all times weakness of digestion. He had had also repeated spells during the previous five years, characterized by severe pain in the pit of the stomach coming on before meals and relieved by eating; such spells lasted several months at a time, with intervals for months when there was no pain at all. He always had a ravenous appetite, ate very heartily, but was hungry again in three or four hours, no matter how much he ate. This man was another tall, slender, lanky individual, with a loud succussion splash and considerable tenderness over his stomach, but positively no palpable mass or tenderness over his appendix area. His stomach contents showed an excessive hyperchlorhydria, the total acidity 90, the free HCl 40 and the combined HCl 20. Operation was advised for ulcer and was performed, but no ulcer of stomach or duodenum was found. The appendix was then investigated and found to be bound down and kinked, with many old adhesions about it—a typical chronic inflammation of long standing.

Both of the foregoing cases would now be recognized before operation by negative radiographic plates of the stomach and the duodenum and by more or less positive findings about the cecum and appendix. As stated previously, and now emphasized again, no operation for ulcer is in these days justifiable unless roentgen-ray plates have first been made and studied.

4. *Cases Simulating Gall-bladder Disease.* These cases offer one of the most difficult problems in diagnosis, and not unfrequently the correct solution is found only at the operating table. Many such errors have been made in the past and they will continue to be made in the future, though probably less frequently as fluoroscopic and radiographic examinations are employed more often. Both conditions give rise to recurring attacks of abdominal pain, with intervals of good health between. Ordinarily we depend upon the site of pain and tenderness and the direction of radiation of pain to distinguish one from the other.. But an inflamed appendix pointing upward along the ascending colon may cause the greatest pain and

tenderness just below the costal margin, while the pain of biliary colic may be referred downward into the right lower quadrant instead of backward under the shoulder-blade. Either attack may make its onset with chill, followed by fever and leukocytosis; either may be accompanied by vomiting; either may be followed by transient jaundice; and either condition may give rise to reflex gastric symptoms between the acute attacks. Three cases in this group of 71 were wrongly diagnosed as gall-bladder disease, and only at operation was it discovered that the real disease was chronic appendicitis. But none of these had been given the benefit of roentgen-ray examination or the error might have been avoided.

5. *Pelvic Disease Simulating Chronic Appendicitis.* In female patients the question frequently arises whether the symptom-complex is due to disease in the appendix or in the right broad ligament, for a diseased appendix pointing downward toward the pelvic brim may cause constant pain and tenderness low down, just above Poupart's ligament, while an inflamed ovary or tube may refer its pain upward into the right lower quadrant. The following case history illustrates the difficulty in these cases about reaching a correct decision:

A woman, aged twenty-four years, seen in March, 1912, complained of attacks of stomach trouble at intervals for ten years past, the last one persisting for a year. During these she had much gas and belching after food and an unnatural, craving appetite, not long satisfied; also much nausea on waking in the morning and often during the day, coming on several hours after eating, though she never vomited. All these stomach symptoms were worse during her menstrual period. She had no pain in the stomach but had experienced several attacks of pain lower down in the abdomen. Her bowels were habitually constipated. Examination revealed slight thickening in the appendix area, but no tenderness or definite mass. Pelvic examination was negative. Stomach analysis showed a hyperchlorhydria, with total acidity 70, free HCl 20, combined HCl 30. The patient's gastric symptoms were all easily explained by her hyperchlorhydria, but the absence of gastric pain from the history and of tenderness over the stomach practically excluded ulcer, while the recurring attacks of pain in the lower abdomen, the chronic constipation and the at least suspicious findings in the appendix area were interpreted to mean chronic appendicitis, to which the hyperchlorhydria was secondary. Operation, however, revealed only slight congestion of the appendix and no evidence of previous inflammation sufficient to explain the symptoms, while an ovarian cyst was found on the right side, the size of a walnut. No other pathology was discovered. Both the appendix and the cyst were removed and the stomach trouble subsequently disappeared altogether.

Naturally the most important evidence of pelvic disease is found

by vaginal examination. But this is not always conclusive. In the first place, when the anatomical changes are slight, they may be missed unless the examination is made under an anesthetic and muscle spasm thus eliminated. In another instance the appendix itself, inflamed and tender, may hang down over the brim of the pelvis, be felt on vaginal examination and wrongly interpreted as a diseased Fallopian tube. Thirdly, it is not at all uncommon to find at operation both the appendix and the Fallopian tube diseased when only one has been recognized by previous examination. Thus errors not uncommonly occur. Either condition gives rise to long-standing pain and soreness in the right lower quadrant, with recurring acute attacks when these symptoms are greatly increased in intensity, and either may cause reflexly persistent disturbance of digestion, with hyperchlorhydria.

6. *Kidney Stone Simulating Chronic Appendicitis.* This condition is mentioned as a possibility in differential diagnosis, but it has never led to error in the cases under review. The particular source of trouble is the stone escaped from the right kidney and lodged in the ureter, causing pain and tenderness and recurring attacks of colic in the right side of the abdomen in the appendix area. But aside from the evidence afforded by a careful history, bringing out the fact of radiation of pain to the bladder or to the genitalia at some time during its exacerbations, with symptoms of urinary disturbance; aside also from negative findings on palpation over the appendix; there is the positive evidence afforded by urine analysis, disclosing pus and blood corpuscles in the sediment; and the final and unmistakable proof afforded by cystoscopy, ureteral catheterization, pyelography and roentgen-ray plates.

7. *Recurring Headaches Due to Chronic Appendicitis.* Seven patients presented themselves for recurring headaches who were found to have a diseased appendix as the only adequate explanation. These cases could be best set down as "gastric headaches," but their stomach disturbance was obviously reflex from some disease outside the stomach itself. The complaint of "sick headaches" is a common one. Frequently these headaches are found to be associated with some fault in the stomach's functions and disappear after this fault is corrected. But in a small proportion the condition underlying both the headaches and the gastric disturbance can be found in chronic appendicitis. The following is an instance of the part the appendix may play.

A man, aged forty years, sought advice in December, 1916, for headaches recurring at intervals for a number of years past, and persisting in spite of glasses worn for three years continuously, fitted to overcome eye-strain. The pain in his head gradually had grown more and more constant, at times becoming so severe he could scarcely bear it. This pain was felt sometimes through the temples, sometimes through the back of his head, sometimes all

over the top. He complained also of chronic constipation, but had a good appetite and no digestive distress. He also complained, but only when asked directly about it, of a pain in the right side of his abdomen; usually only a sense of heaviness, as if there was a big lump there; but at times this became severe pain. This man was very large and heavy. He had no evidence of nephritis, a blood-pressure within normal limits and a negative Wassermann reaction. His stomach contents showed only a slight subacidity after a test meal. In the right lower quadrant was found a very definite tender mass in the appendix area, the size of a hen's egg, constantly present at several different examinations on different days. Radiographic plates showed filling defects in the cecum and ascending colon and no barium could be caused to enter the appendix. At operation, in July, 1917, the appendix was found kinked at its base, hypertrophied and elongated, with numerous old adhesions binding it down. After its removal the pain in the head, previously constant, entirely disappeared, though medical treatment of all kinds had failed to relieve it. No attempt is made to explain how the inflamed appendix caused the headaches, but the fact remains that one disappeared with the other.

8. *Neurasthenia Due to Chronic Appendicitis.* Finally in 3 of the cases included in the group here reviewed the sole complaint was of lack of energy and vitality, and the patient's story corresponded to the condition commonly called "neurasthenia." The diagnosis of an inflamed appendix was arrived at only after routine investigation in an effort to discover why the symptoms had arisen. One of these histories will suffice to demonstrate that such a relationship may exist.

A patient, aged thirty-seven years, seen in September, 1916, complained of congestion in his head, inability to apply himself to his work, insomnia, great restlessness and general "nervous breakdown." He was a large, well-nourished man, apparently in good health, but had been compelled to give up his work as a clergyman because of his symptoms. No abnormality was found in any organ on physical examination and the stomach contents showed a normal analysis after a test-meal. No cause could be found for his symptoms except a chronic constipation. A series of roentgen-ray plates, however, made of the gastro-intestinal tract showed that the appendix filled readily with bismuth but did not empty again, retaining the bismuth even after seventy-two hours. In spite of this finding, as no evidence of chronic appendicitis could be discovered on physical examination repeatedly made, the radiographic evidence was for the time disregarded. But finally, as no improvement resulted from any treatment given and as the patient remained incapacitated for his work, removal of the appendix was advised. This was done in May, 1917. The appendix and the head of the colon were found bound down by very old and very dense adhesions. The

appendix was sharply angulated at its base, close to the bowel, and its distal portion distended and thickened. After removal of the appendix this patient made a prompt convalescence. He rapidly recovered his usual energy and desire for work, went back to it in July and is now apparently as active and vigorous as ever before in his life. Nevertheless, this case does not prove that neurasthenia is always or often due to chronic appendicitis but only that it may be in exceptional instances.

The object of all diagnosis is rational treatment, and once chronic appendicitis is diagnosed there is no cure but surgery. We wish therefore to be very certain before we advise; certain that this condition exists; certain that it is responsible for the ill health of which the patient complains; and reasonably certain that removal of the diseased appendix will restore good health. These considerations have prompted this review of the methods by which we reach a decision and of the other possibilities that must be remembered before we select the appendix as the proper point of attack.

MULTIPLE NEUROFIBROMATOSIS (VON RECKLINGHAUSEN'S DISEASE) AND ITS INHERITANCE: WITH DESCRIPTION OF A CASE.

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1. Classical Symptoms of Multiple Neurofibromatosis. Among the rarest of abnormal conditions of the surface of the body is that characterized by a large number of sessile or pedunculated swellings or tumors, sometimes soft and elastic, sometimes firm and tough, that vary in size from that of a millet-seed to that of a child's head. The skin over the tumors is frequently discolored, brownish or bluish, or reddish through enlarged capillaries. They may be present from birth and they may tend to grow, usually very slowly, but they rarely, if ever, regress in size. When numerous and large in one area they may become confluent. Examination shows that they are fibrous tumors, frequently containing one or more nerve fibers; or, when more deep-seated, being enlargements of the perineurium of the nerve trunks. They are due to localized cell proliferation of the connective-tissue sheaths of the nerves.